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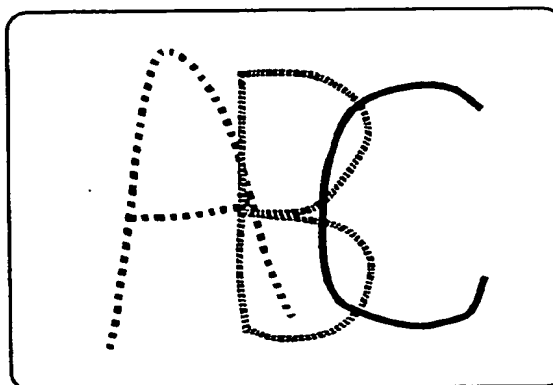
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(54) **Data processing method and apparatus to input and output trace data**

(57) It is an object of the invention to provide data processing method and apparatus in which even in case of overlappingly displaying a plurality of traces, those traces can be distinguished and observed and input time points of the traces can be distinguished by merely seeing the traces. Another object of the invention is to provide data processing method and apparatus in which time information of time points when a plurality of image information is inputted is stored so as to correspond to each image information and each image information is displayed by each attribute that is automatically determined in accordance with an elapsed time in accordance with the time information, so that a plurality of image information inputted in a state in which they can be displayed on the same picture plane can be easily discriminated.

**FIG. 9**



## Description

### BACKGROUND OF THE INVENTION

#### Field of the Invention

The invention relates to data processing method and apparatus which can input and output trace data.

The invention also relates to data processing method and apparatus which can input and output image data.

The invention further relates to data processing method and apparatus which can output image data in various forms by changing attributes of the image data designated.

#### Related Background Art

As an information terminal apparatus of the type such that an operating instruction and data are inputted by a trace written by a pen, for example, there has conventionally been known an apparatus in which a fundamental software such as "Windows for Pen Computing (registered trade name)" made by Microsoft, "PenPoint (registered trade name)" made by Go Corporation, or the like is installed.

In the above conventional apparatuses, however, if a trace is inputted as it is so as to be overlapped onto a trace which has already been drawn, since the traces are displayed by the same attributes, the traces on a display screen become complicated, it is very hard to see the traces, and an operating efficiency is bad. Further, input time points of the traces displayed cannot be distinguished.

Hitherto, there is an apparatus such that when a trace is drawn or an image is inputted, attributes such as color, line type, line width, area type, and the like of the trace or image are designated and the trace or image is displayed or printed on the basis of the designated attributes.

In the above conventional apparatus, however, when attributes of a trace or image which are newly inputted are designated to those different from the attributes of the trace or image which have already been inputted, an operation to change the attributes has to be performed. In the case where the attributes of at least two traces or images which have already been inputted are changed to different kinds of attributes as well, on the other hand, an operation to specify the trace or image as a target of a change in attributes and an operation to change the attributes are needed.

### SUMMARY OF THE INVENTION

The invention is made in consideration of the above drawbacks and it is an object of the invention to provide a trace input/output electronic apparatus and its display control method, in which even if many traces are overlapped and inputted, the traces can be distinguished

and input time points of the traces can be distinguished by merely seeing the traces.

Another object of the invention is to provide data processing method and apparatus, in which even if attributes are not designated to different attributes, the operator can discriminate a plurality of traces or images which are outputted to the same picture plane, an operation to designate attributes is unnecessary, and an operating efficiency is high.

### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a diagram showing a construction of the invention;

Fig. 2 is an external view of a trace input/output electronic apparatus according to an embodiment of the invention;

Fig. 3 is a block diagram showing a construction of the apparatus of Fig. 2;

Fig. 4 is a diagram for explaining a display form of a trace;

Fig. 5 is a diagram for explaining a display form of a trace;

Fig. 6 is a flowchart for a display control process of a trace;

Fig. 7 is a flowchart showing in detail a part of the process in Fig. 6;

Fig. 8 is a diagram for explaining a display form of a trace;

Fig. 9 is a diagram for explaining a display form of a trace;

Fig. 10 is a flowchart showing a modification of the process in Fig. 7; and

Fig. 11 is a diagram for explaining a display form of a trace.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the invention will now be described hereinbelow with reference to the drawings.

[First embodiment]

Fig. 2 is an external view of a trace input/output electronic apparatus according to an embodiment of the invention. A liquid crystal display 12 with a digitizer is provided for a casing 11. When a trace is inputted by a trace input pen 13, a trace 14 is displayed on the display 12.

Fig. 3 is a block diagram showing a construction of the apparatus. The apparatus comprises: a CPU 101 for controlling the whole apparatus; an ROM 102 for storing a control program or the like of processes which are executed by the CPU 101, for example, processes shown in flowcharts, which will be explained hereinafter, or the like; an RAM 103 to store data during an arithmetic operation of the CPU 101 or the like; a digitizer 105 for detecting a contact position of the trace input pen 13

and inputting image data comprising a trace written by the pen as a coordinate dot train, a display 106 such as liquid crystal display, CRT, or the like; an I/O controller 104 to which the digitizer 105 and liquid crystal display (LCD) 106 are connected and which functions as an interface of a data input/output and an operation input; and a timer 107 for measuring a time.

A trace is inputted by the exclusive-use trace input pen 13. A line is drawn at a position corresponding to the LCD 106 on the basis of coordinate data which is sent from the digitizer 105 to the CPU 101. Fig. 4 shows a display picture plane at that time. A trace 21 is displayed by a dense solid line. Fig. 5 shows a case where a new trace 32 is inputted. However, a brightness as a display attribute of the trace 21 which has already been drawn is changed to a lower brightness, so that a trace 31 is drawn.

A control program for the CPU 101 to execute various processes, which will be explained in the embodiment, can be previously stored in the ROM 102. However, it is also possible to construct in a manner such that prior to executing the process, a control program stored in another memory medium is read out therefrom and is stored into the RAM 103 and is used. As another memory medium in this case, it is possible to use an FD, a CD-ROM, or the like which is detachable to the apparatus or a memory medium of another apparatus which can transmit and receive data through a public line or an LAN.

As means for inputting an image, in addition to a trace input pen and a digitizer, another input unit such as touch panel, mouse, or the like which can input an image can be used. Or, an image inputted by another apparatus can be also inputted through the public line or LAN.

The process in the CPU 101 for realizing the above operations will now be described with reference to flowcharts of Figs. 6 and 7.

In Fig. 6, since a trace is not yet inputted in step 41, 0 is set into a variable *i*. In step 42, a check is made to see if a trace has been inputted from the digitizer 105. If YES, step 43 follows. If NO, step 49 follows. In step 49, when *i* = 0, the processing routine is returned to step 42. If NO, step 50 follows. When *i* is inputted and indicates the number of traces to be displayed on the display 106. The value of *i* is increased by "1" at a time point when a pen is put down. Namely, when there is no trace, no operation is performed and the apparatus is returned to a state to wait for an input.

In step 43, the value of the variable *i* is increased by "1" and a time to start the drawing is measured by the built-in timer 107 and is stored as *T(i)* into the RAM-103. In step 44, display attributes of the inputted trace are initialized. In this instance, a brightness of the trace is set to the maximum value. In step 45, the trace is displayed to the LCD 106 on the basis of coordinate data stored in the RAM 103 in correspondence to *T(i)* that is inputted as an *i*-th trace. In step 46, a check is made to see if the pen is not put up but the inputting operation of the trace

is continued. When the trace is inputted, step 47 follows. When the pen is put up and the input of the trace data is finished, step 50 follows. In step 47, the trace is displayed in a manner similar to step 45. In steps 48 and 50, a process to change the display attributes of all of the traces shown in Fig. 7 is executed. After completion of step 48, the processing routine is returned to step 46. When step 50 is finished, the processing routine is returned to step 42.

Fig. 7 is the flowchart for the process to change the display attributes of all of the traces in steps 48 and 50. In step 51, a variable *j* is set to "1". In step 52, the current time is read out from the built-in timer 107 and set into a variable *S*. In step 53,  $t = S - T(j)$  is executed as an elapsed time when the trace is displayed. In step 54, the brightness *Q* of the trace is calculated by  $\alpha t$  ( $\alpha$  is a constant) and is set as a display attribute. In step 55, when *Q* is equal to or less than a predetermined prescribed value, the trace is deleted. In step 56,  $j = j + 1$  is executed. In step 57, when *j* is larger than the number of traces (*i*), the processing routine is finished. If NO, the processing routine is returned to step 53.

By the above processes, even when the trace is overlapped and inputted, a difference between the new and old traces can be recognized. The user is not confused. Hitherto, as shown in Fig. 8, when a trace is overwritten into the same region, the display picture plane merely becomes complicated. However, according to the embodiment, as shown in Fig. 9, even if the user successively inputs traces into the same region so as to be overlapped, the drawn trace gradually becomes thin (the brightness decreases), so that the user can distinguish the traces which were overwritten and drawn without mixing the traces. In Fig. 9, although a change in brightness is not always clear, the brightness of "A" is the lowest and the brightness of "B" is the second lowest brightness.

Consequently, in case of continuously inputting hand-writing characters, even if the character is overlapped and inputted, it is not confused with the character which was inputted just before it. Therefore, even in a small input region, the next character can be inputted while seeing the character trace just before.

Therefore, the character input region can be reduced and the apparatus can be miniaturized. Moreover, a larger number of trace information can be recorded in a limited display region.

Further, since the traces can be distinguished with respect to the time, even in an electronic memorandum notebook application or the like, the input time point can be recognized. It is not always necessary to add a date, a time, and the like to the memorandum.

Even in case of a temporary memorandum, since the trace is deleted with the elapse of time, a troublesome to actively delete the old trace can be omitted.

## [Second embodiment]

Fig. 10 is a flowchart for a process to change the display attributes of all traces according to the embodiment. The processes other than this process are substantially the same as those in the first embodiment.

The flowchart shown in Fig. 10 is obtained by replacing step 54 in the flowchart shown in Fig. 7 to step 84. In step 84, a thickness of trace is used as a display attribute of the trace. The other processing steps are similar to those in Fig. 7.

Fig. 11 shows a display picture plane of the second embodiment and it will be understood that the trace which was inputted first is displayed thinly.

In the first embodiment, the change in brightness cannot be displayed in case of using a liquid crystal display of two monochromatic gradations. However, in the embodiment, since the display attribute is the thickness of trace, an effect similar to that in the first embodiment is obtained irrespective of the number of gradations of the liquid crystal display.

It is an object of the invention to provide data processing method and apparatus in which even in case of overlappingly displaying a plurality of traces, those traces can be distinguished and observed and input time points of the traces can be distinguished by merely seeing the traces. Another object of the invention is to provide data processing method and apparatus in which time information of time points when a plurality of image information is inputted is stored so as to correspond to each image information and each image information is displayed by each attribute that is automatically determined in accordance with an elapsed time in accordance with the time information, so that a plurality of image information inputted in a state in which they can be displayed on the same picture plane can be easily discriminated.

## Claims

1. A data processing apparatus characterized by comprising:

image input means for inputting an image;  
memory means for storing both of image information inputted by said image input means and time information indicating a time when said image information is inputted; and  
display control means for judging an elapsed time from the input of said image information in accordance with the time information of said image information in case of displaying the image information stored in said memory means and for controlling so as to change a display attribute of said image information in accordance with said elapsed time.

2. An apparatus according to claim 1, characterized in that said display control means controls so as to

reduce a brightness of the image with an increase in said elapsed time.

3. An apparatus according to claim 1, characterized in that said display control means controls so as to change a color of the image information in accordance with said elapsed time.
4. An apparatus according to claim 1, characterized in that the time information which is stored in said memory means is time information of a time point when the input of said image information is started.
5. An apparatus according to claim 1, characterized in that said image input means is a digitizer.
6. An apparatus according to claim 1, characterized by further having a display to display said image information.
7. A data processing method characterized by comprising the steps of:  
inputting an image;  
storing both of said inputted image information and time information indicating a time when said image information is inputted;  
judging an elapsed time from the input of said image information in accordance with the time information of said image information in case of displaying said stored image information; and  
controlling so as to change a display attribute of said image information in accordance with said elapsed time.
8. A method according to claim 7, characterized in that the display of said image is controlled so as to reduce a brightness of the image with an increase in said elapsed time.
9. A method according to claim 7, characterized in that the display of said image is controlled so as to change a color of the image information in accordance with said elapse of time.
10. A method according to claim 7, characterized in that said time information which is stored is a time information of a time point when the input of said image information is started.
11. A method according to claim 7, wherein said image is inputted from a digitizer.

FIG. 1

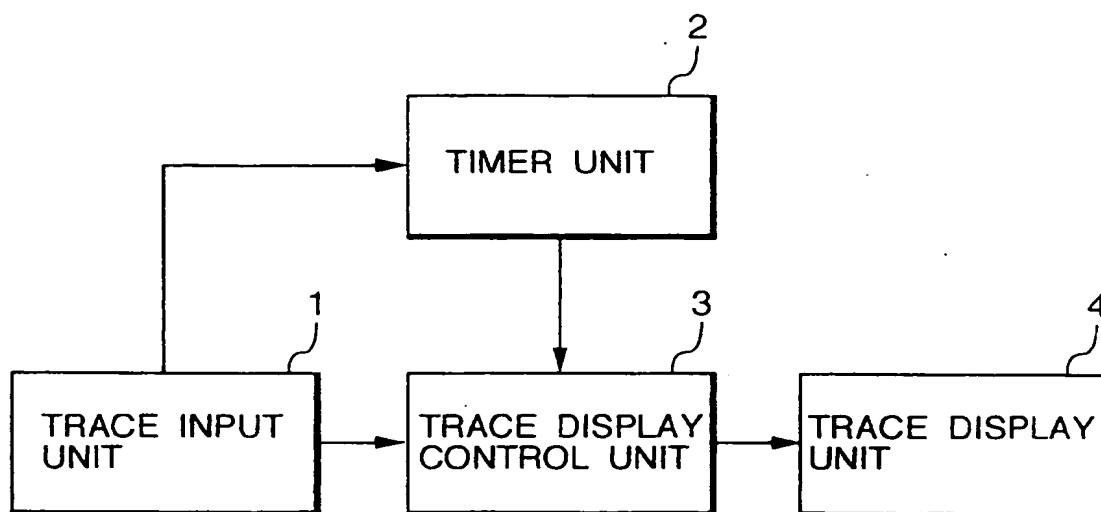


FIG. 2

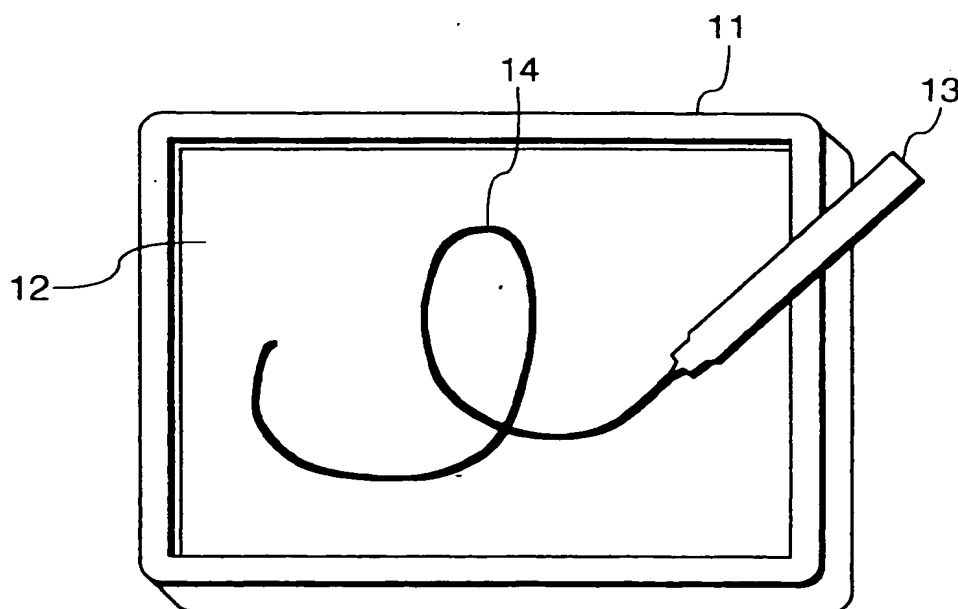


FIG. 3

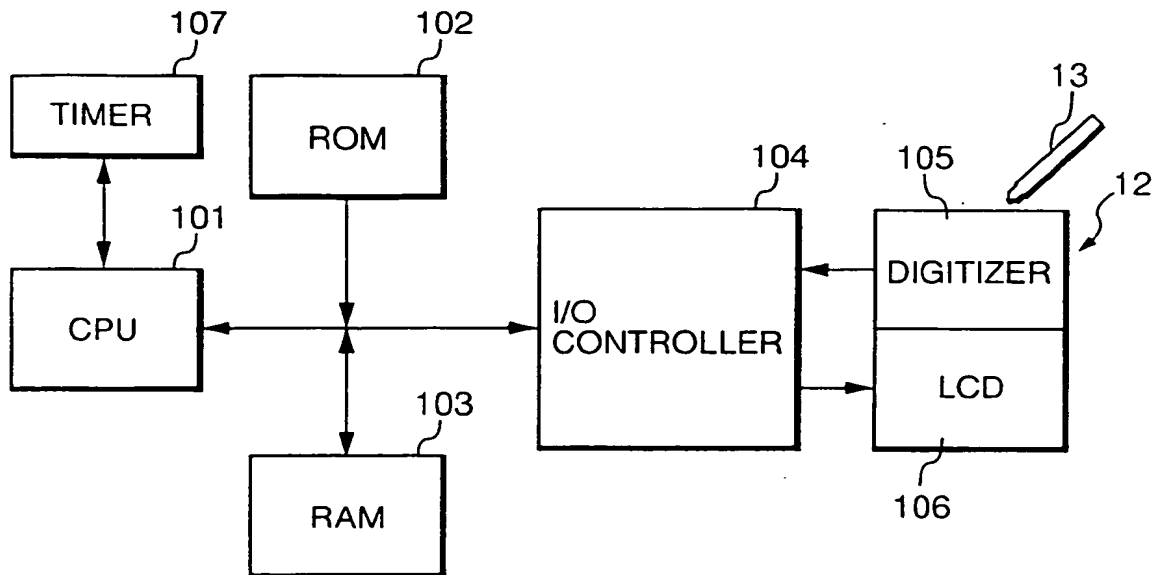
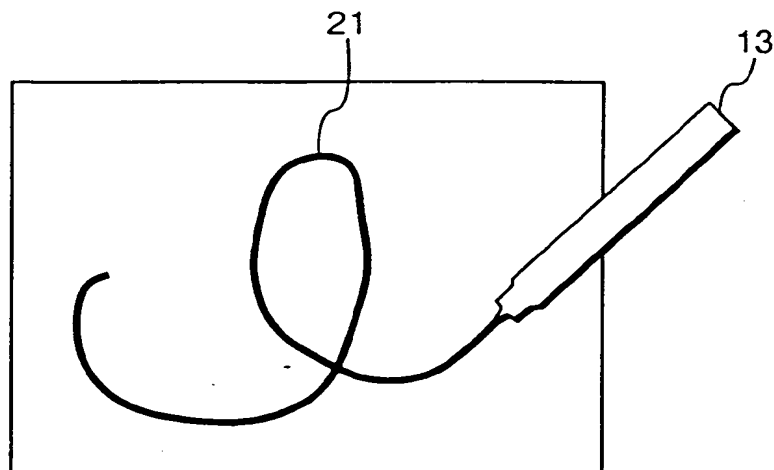
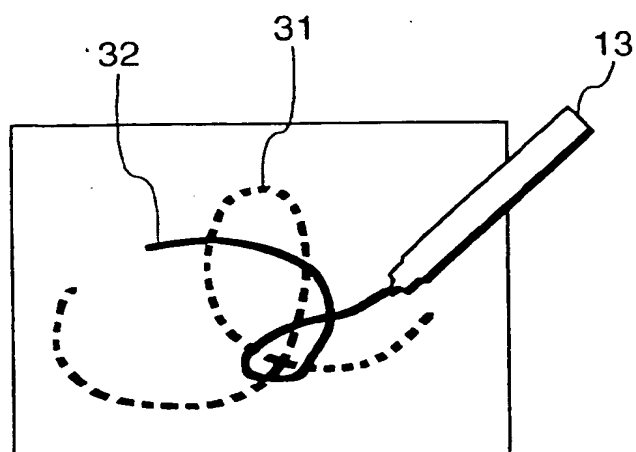


FIG. 4



*FIG. 5*



*FIG. 8*

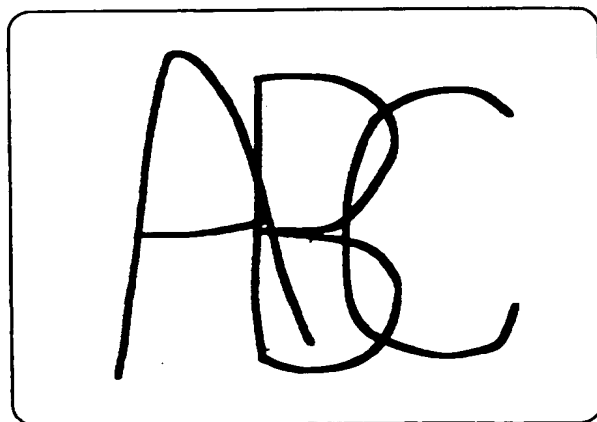


FIG. 6

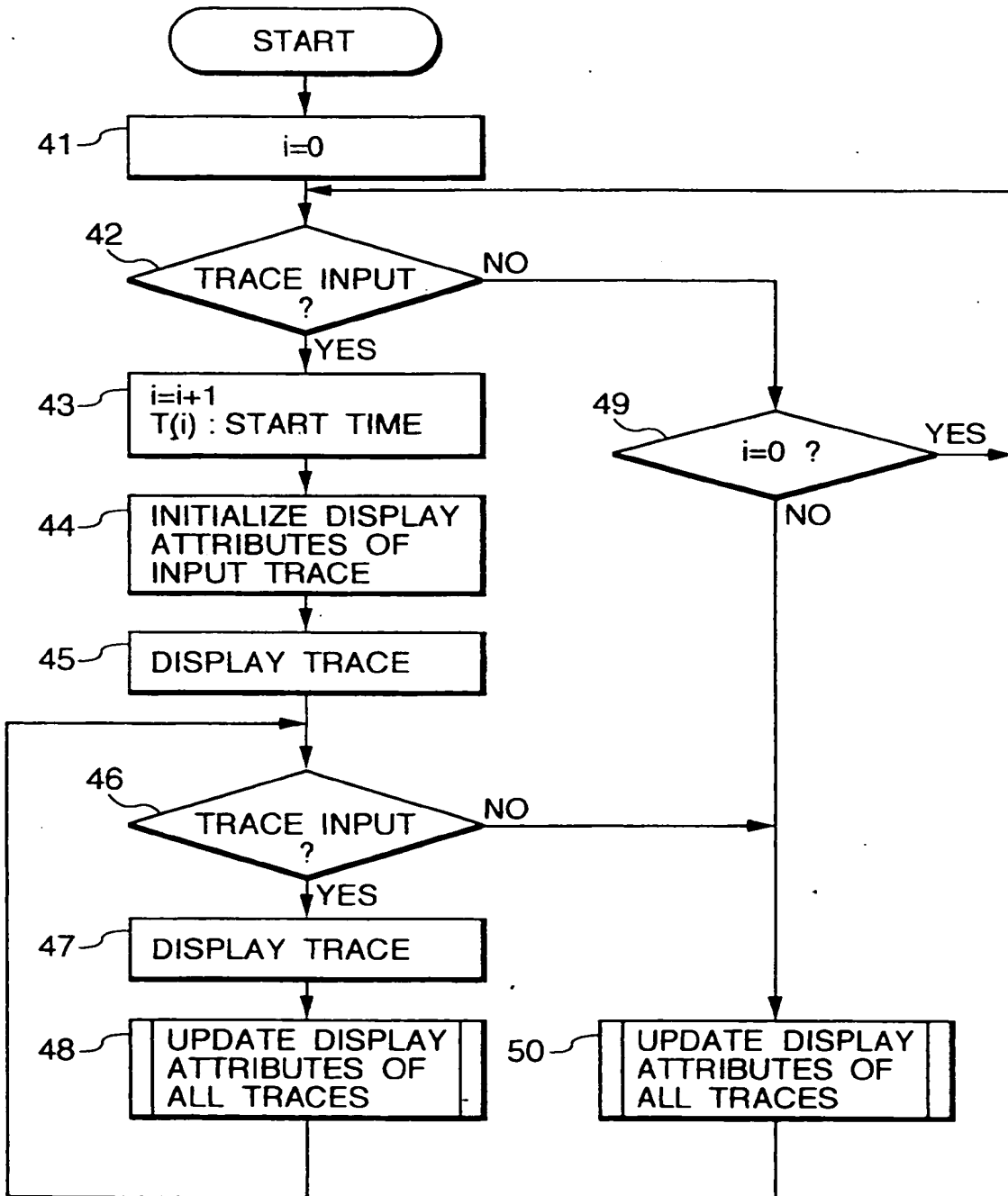
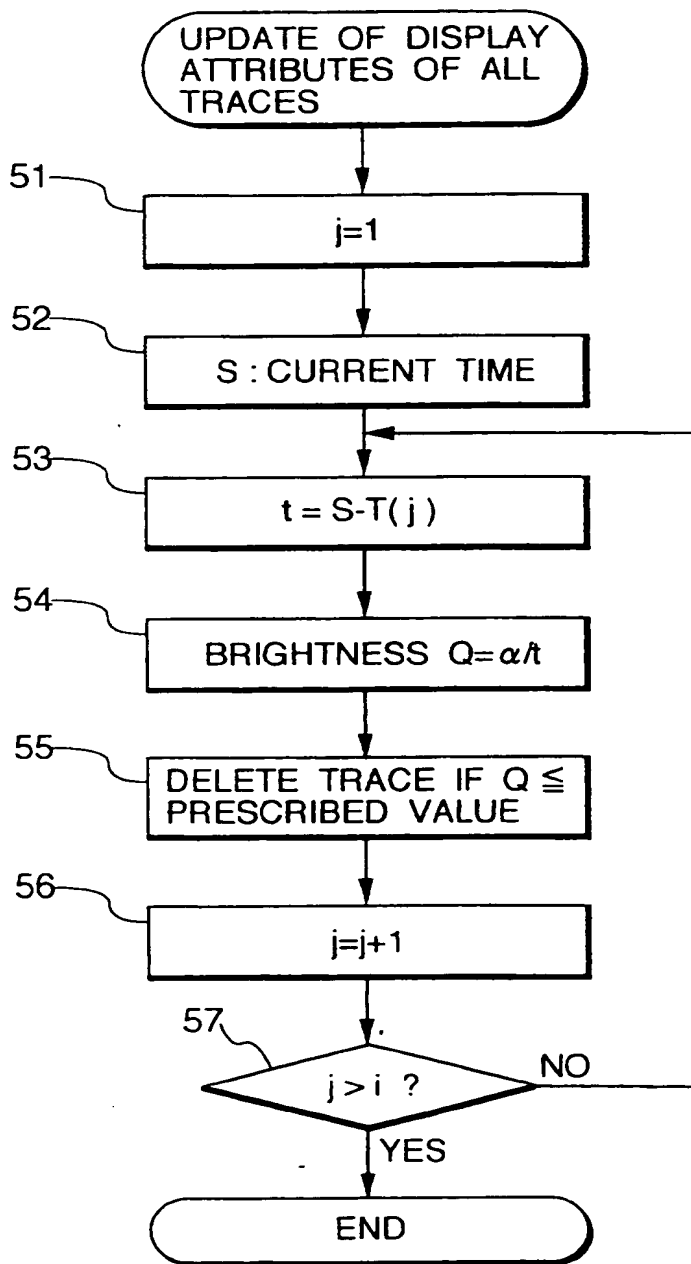
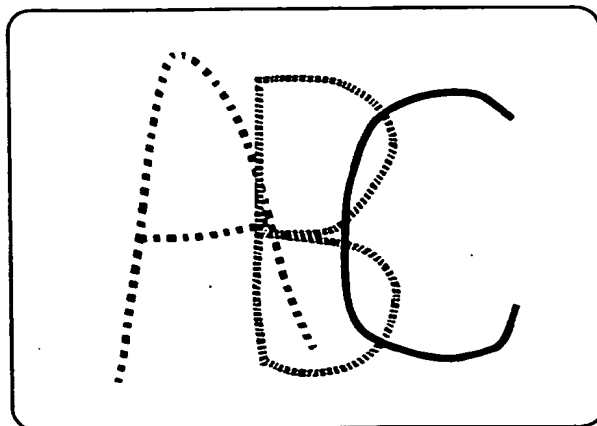


FIG. 7



*FIG. 9*



*FIG. 11*

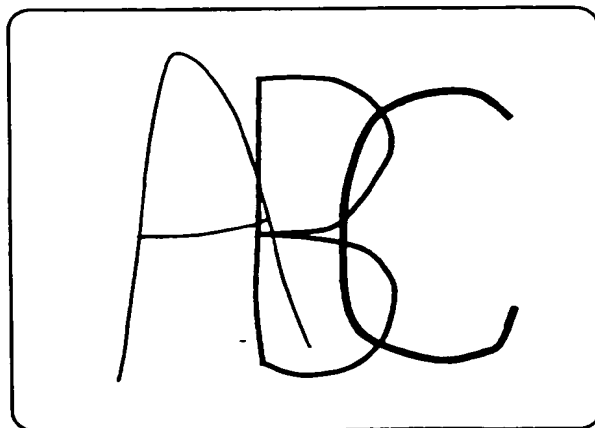
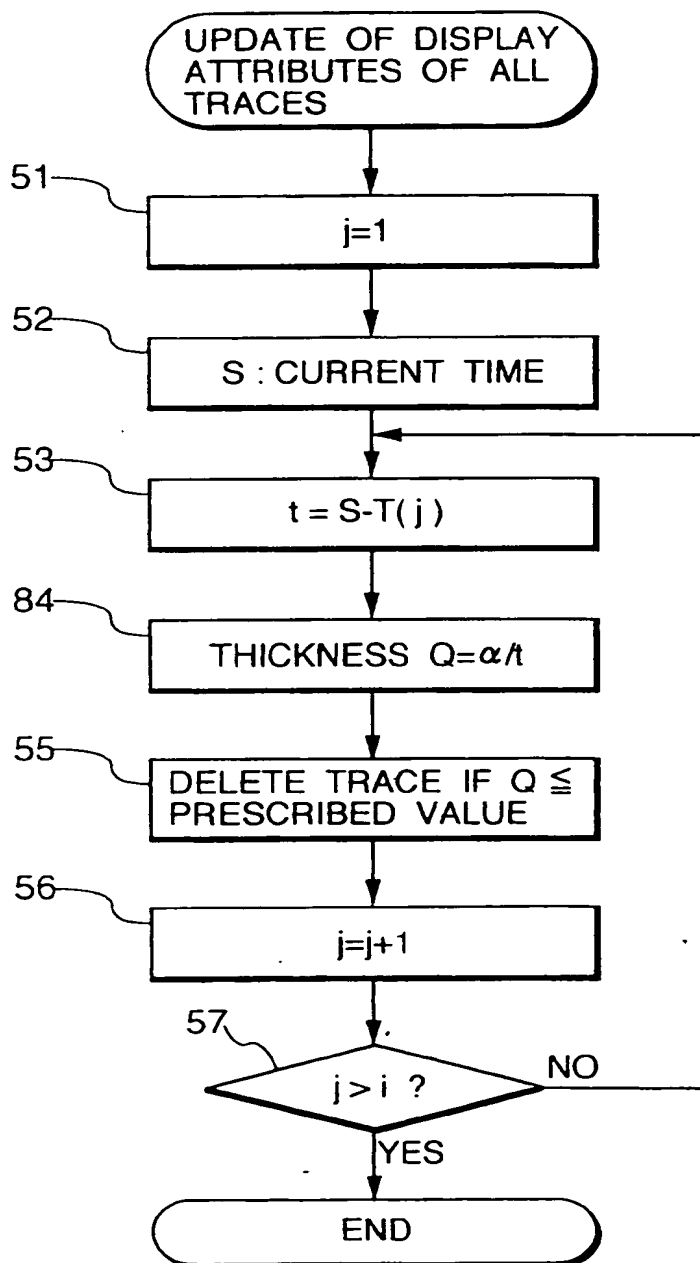


FIG. 10





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# EUROPEAN SEARCH REPORT

Application Number  
EP 96 10 6020

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP-A-0 367 405 (WILLAN STEPHEN BRIAN) 9 May 1990 * the whole document *	1-11	G06F3/033 G06T11/00
A	EP-A-0 495 612 (XEROX CORP) 22 July 1992 * abstract *	1,7	
A	PATENT ABSTRACTS OF JAPAN vol. 12, no. 417 (P-782), 7 November 1988 & JP-A-63 155370 (FUJITSU LTD), 28 June 1988, * abstract *	1,7	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			G06F G06T
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23 July 1996	Examiner Ciarelli, N
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